DOER report

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The Commonwealth of Massachusetts

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Governor

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2001 Energy Efficiency Activities in Massachusetts

Division of Energy Resources

Commonwealth of Massachusetts

Office of Consumer Affairs and Business Regulation

Introduction

Massachusetts law requires customers of electric distribution companies to contribute a portion of their electricity charges to support activities that reduce electricity consumption. Enacted as part of the 1997 Electric Industry Restructuring Act ("the Act"), the policy recognizes that energy efficiency investments can: lower the overall cost of electricity without reducing comfort or convenience, lower the emission of harmful air and water pollutants, create jobs, and stimulate the economy. The investments provide for the installation of high efficiency lighting, motors, air conditioners and appliances; the construction of high-efficiency homes and commercial buildings; and more.

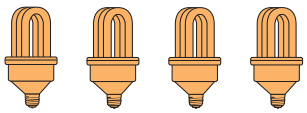
This summary provides an overview of the Division of Energy Resources' ("the Division") fourth annual legislative report on the status of ratepayer-funded energy efficiency activities in the Commonwealth, and the extent to which the statewide energy efficiency goals are being met.

Highlights

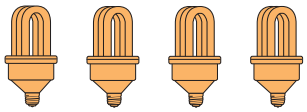
- ***Energy efficiency programs improved reliability and lowered wholesale electricity prices through demand reduction by almost $8.5 million in 2001.***
- ***Participants saved over $28 million on their 2001 electric bills. These bill savings are projected to grow to approximately $332 million over the lifespan of the installed measures.***
- ***Participating customers and ratepayers invested $183 million in 2001 to achieve the savings.***
- ***Energy efficiency investments created an estimated 1,841 new jobs, contributing $129 million to the gross state product in 2001. An additional 290 jobs will result from bill savings over the lifetime of these investments.***
- ***Energy efficiency programs improve air quality in Massachusetts and the New England region.***

Massachusetts Energy Efficiency Programs Win Top Honors Nationally

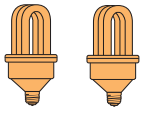
Northeast Energy Efficiency Partnerships Sponsored by NSTAR, MECO, WMECO, Unitil & CLC (4 Awards)



Massachusetts Electric/National Grid (4 Awards)



Western Massachusetts Electric/Northeast Utilities (2 Awards)



Massachusetts energy efficiency administrators received 10 exemplary awards out of 31 given nationally by the American Council for an Energy Efficient Economy (see page 8 for details).

The overall goal of Massachusetts energy efficiency programs is to strengthen the economy and protect the environment by increasing the efficiency of energy use. Listed below are the specific objectives of these programs.

Energy Efficiency Operational Objectives:

(1) Reduce the use of electricity cost-effectively (as directed by the Department of Telecommunications and Energy).
(2) Ensure that energy efficiency funds are allocated to low-income customers consistent with the requirements of the Act, and allocated equitably to other customer classes.

Energy Efficiency Programmatic Objectives:

(3) Reduce customer energy costs by balancing short-run and long-run savings from energy efficiency programs.
(4) Support the development of competitive markets for energy efficiency products and services.

The following report chronicles the fourth year of the energy efficiency programs designed to meet these objectives.

2001 Participants Saved Over $28 Million On Their Electric Bills

Program participants saved over $28 million on their 2001 electricity bills, an increase of $9 million from the previous year. This total is significantly higher than in prior years due to the increase in default and standard offer prices during 2001. Energy efficiency activities become even more important during times of high electricity and fuel prices. Assuming that the energy efficiency equipment installed in 2001 remains in place for its full lifetime (an average of almost 15 years), total savings are projected to grow to approximately $332 million. Collectively, participants saved an average of 5 percent on their 2001 electricity bills. Table 1 shows average bill impacts by customer type.

Table 1: 2001 Average Bill Impacts from Energy Savings

Customer Class	Total Annual Bill Reductions for Participants	Avg. Annual Bill Savings per Participant
Low-Income	$1,010,178	$39
Residential	$8,187,869	$37
Small C&I	$2,535,195	$774
Medium C&I	$3,158,496	$1,854
Large C&I	$13,875,175	$16,737
Total/Average	$28,766,914	$114

Program participation levels in 2001 varied greatly among the different customer sectors (see Table 2). Low-income customer participation rates were 5 percent, based on an eligibility threshold of 200 percent of the Federal Poverty Level. Comparatively, residential participation levels were more than twice that of low-income customers, at 13 percent of total eligible households. Large C&I customers continue to have a high participation rate, reflecting the fact that large electricity users reap the greatest savings (as a percent of their total operating costs) by improving the efficiency of their facilities, and often participate in programs more than once a year. Small C&I customers, and to a lesser extent Medium C&I customers, have the lowest participation rates despite potential bill savings and efforts to target these customers. These lower rates can be explained by barriers these customers face to investing in energy efficiency, including a lack of energy management resources.

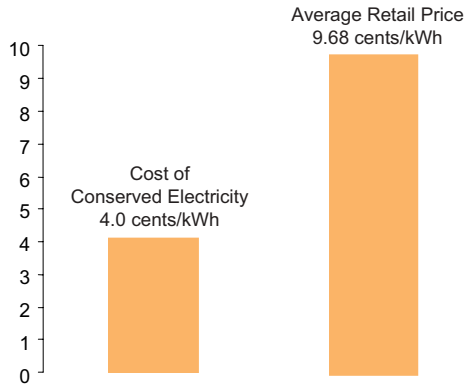
Table 2: 2001 Energy Efficiency Program Participation

Customer Sector	# of Participants	% Served
Low-Income	27,114	5
Residential	219,769	13
Small C&I	3,275	1
Medium C&I	1,704	4
Large C&I	829	15
Total/Average	252,691	10

The Cost To Conserve Electricity Is Nearly 59 Percent Less Than The Cost To Buy It

A total of $183 million was invested in energy efficiency program activities in 2001 (comprised of $135 million collected from ratepayers and $48 million contributed by participants). An estimated 4,571 million kilowatt-hours will be saved over the lifetime of the investments. On average, this represents a cost of conserved energy of 4.0 cents/kWh for program participants – nearly 59 percent less than the projected average retail electricity price of 9.68 cents/kWh (in 2001 dollars) over the same period. Figure 1 illustrates this comparison.

Figure 1: Cost of Conserved Electricity vs. Average Retail Price



Energy Efficiency Investments Creating Jobs in the Commonwealth

Energy efficiency activities promote the expansion of Massachusetts energy efficiency industries and other industries in the state. For example, the Division's economic model estimates that 2001 ratepayer-funded investments in energy efficiency will create 1,841 new jobs in Massachusetts, contributing $129 million to the gross state product. In addition, $66 million in disposable income will be gained from these jobs, most of which will be realized in the short-term. These jobs are concentrated in the services, retail trade and manufacturing sectors.

Energy efficiency activities also have longer-term impacts through bill savings to both residential customers and businesses. For example, residential customers can spend their savings on other consumption goods. Businesses become more competitive and can re-invest the savings. These economic impacts through bill savings last over the lifetime of the energy efficiency measures. In addition, the Division estimates that the lifetime bill savings generated 290 permanent jobs. As a result, DOER estimates increases to gross state product and disposable income of $25 million and $18 million, respectively, over the 15-year lifetime of the measures.

The Competitive Market for Energy Efficiency Services Contracts

One indication of whether the competitive market for energy efficiency services has developed in Massachusetts is to observe the extent to which competitive retail suppliers provide customers with products and services. As was the case in 2000, the Division continues to observe a lack of energy efficiency services offered by competitive retail suppliers due to limited activity in the retail electricity market in general.

NSTAR Electric
Low-Income Multi-Family Program

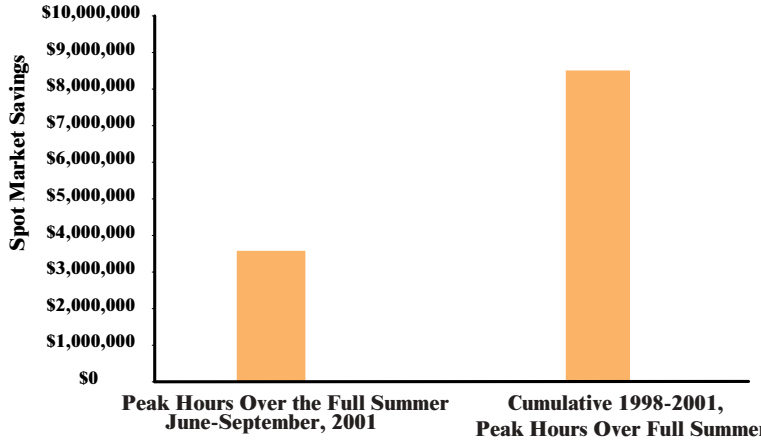
Buttonwood Acres, New Bedford
NSTAR Electric served 132 units at Buttonwood Acres through its Low Income Multi-Family Program. The project consisted of refrigerator replacements and lighting retrofit for high-use fixtures throughout the housing development.
Total Project Cost: $55,886
Total Incentives: $55,886
Participant Cost: $0
Estimated Annual Bill Savings: 68,317 kWh or $7,514
Estimated Lifetime Bill Savings: 915,937 kWh or $100,733

However, another measure of competition in the energy efficiency market is the extent to which ratepayer-funded program services (e.g., program implementation) are competitively procured. The Act requires that competitive procurement processes be used to the greatest extent practicable when delivering programs to Massachusetts customers. These procurement processes benefit customers by providing lower, competitively set program costs, as well as by introducing innovative elements to program designs and/or implementation. In 2001, 83 percent (or $111.8 million) of total energy efficiency expenditures was competitively procured outside of the administering distribution company. This level of competitive procurements was higher than levels in prior years.

Energy Efficiency Investments Improve Reliability and Lower Wholesale Electricity Prices

Load reductions help reduce wholesale energy prices especially during those 10 to 100 hottest hours a year when demand is straining generation capacity to the limit. By reducing demand during peak usage periods, energy efficiency programs contribute to system reliability in terms of supply adequacy within a particular area or region and can enhance reliability of local transmission and distribution networks. This is especially important in Massachusetts where there is constrained transmission into areas in metropolitan Boston and the Cape and Islands. By reducing load and demand on the power distribution network, energy efficiency programs decrease the costly likelihood of system failures. The programs also help avoid higher wholesale energy clearing prices. The Division estimates, for example, that about $3.6 million in additional costs were avoided over the peak summer months (June to September) of 2001. Further, when considering the cumulative demand reduction impact in 2001 from energy efficiency measures installed over the period 1998 through 2001, the Division estimates total savings of $8.5 million (see Figure 2).

Figure 2: Potential Impact of Demand Reductions on the Energy Spot Market



Spot Market Savings	$3,565,620	$8,494,354
Avg. Reduction (MW)	55	222

Energy Efficiency Programs Improve Air Quality in Massachusetts and the New England Region

In year 2001, ratepayer-funded energy efficiency activities reduced the amount of air polluting emissions released by electricity generating units by reducing electricity demand. While it is difficult to attribute energy efficiency-derived emissions reductions to any specific Massachusetts generating facility, overall emissions by the regional power system were reduced. The annual emission reductions for the three most critical pollutants – nitrogen oxides (NO_x), sulfur oxides (SO_2), and carbon dioxide (CO_2) – were 791 tons, 1,581 tons, and 280,100 tons, respectively (see Figure 3). The NO_x emission reductions are roughly equivalent to the annual emissions of 59,799 passenger cars. The SO_2 emission reductions are equivalent to avoiding the burning of 112,567 tons of bituminous coal, the primary type of coal burned for electricity generation. The 280,100 tons of reduced CO_2 emissions are equivalent to the annual emissions of 56,822 cars and light vehicles. The Division further estimates that over the lifetime of energy efficiency measures installed in 2001, emission reductions for these pollutants will be 7,190 tons, 10,029 tons, and 2,231,400 tons, respectively. Thus, the air quality benefits from 2001 energy efficiency activities will continue over the long-term.

Figure 3: Energy Efficiency Programs Reduce Annual Emissions

SO2	NOx	CO2
1,581 Tons	791 Tons	280,100 Tons

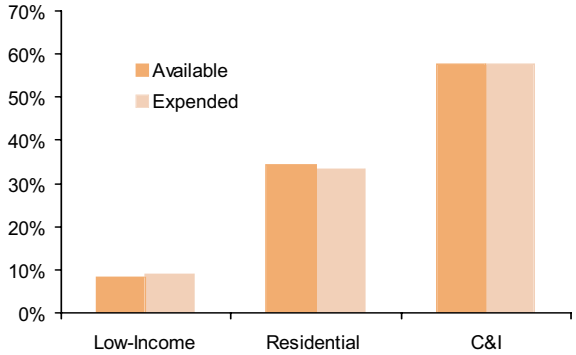
Summary of Energy Efficiency Funds Collected and Expended

A total of $122.1 million was collected from ratepayers during 2001 to support energy efficiency activities. This represents an average of about 2.4 percent of customers' average annual electricity charges. In addition, $25.9 million of unspent funds in 2000 were carried forward to 2001 program budgets, providing a total of $148.0 million in Total Available Funds for 2001. Total expenditures for the year were $135.1 million, leaving a year-end fund balance of $13.0 million.

Funds Equitably Allocated Across Customer Sectors

The Act directs the Division to ensure that ratepayer funding for energy efficiency is equitably allocated among customer sectors. The Act also directs that low-income program funding levels be at least 20 percent of the amount expended for residential programs, and no less than $0.00025 per kWh (based upon total kWh sold to all customers). In its analysis, the Division used 200 percent of the Federal Poverty Level as its standard for participation eligibility for the low-income sector.

Figure 4: 2001 Available vs. Expended Funds



Note:"Available Funds" refers to 2001 collections from customer sectors and carry over funds from 2000. "Expended Funds" refers to 2001 expenditures plus year-end balances.

Available funds in year 2001 for the low-income, residential, and C&I sectors were 8 percent, 34 percent, and 58 percent, respectively, while funds expended were 9 percent, 33 percent, and 58 percent respectively. Comparing Available Funds to Expended Funds, shows that program expenditures were, for the most part, equitably allocated (see Figure 4).

Program Activities Balance Short and Long-Term Savings

Ratepayer-funded energy efficiency programs served two fundamental purposes in 2001: they provided immediate savings for participating customers, while also laying the foundation for long-term savings for all customers by transforming energy efficiency markets.

Of the $135.1 million spent on energy efficiency activities in year 2001, the greatest portion ($82.4 million) was invested in Retrofit programs. These programs encourage the replacement of outdated and inefficient electrical and/or mechanical equipment, such as lighting, heating and cooling systems, motors, energy management systems, and process redesign/improvements. Financial rebates are used to persuade customers to upgrade to higher efficiency equipment.

Fitchburg Gas & Electric/Unitil
Commercial & Industrial
Comprehensive Energy Program

Dennison Manufacturing Company, Fitchburg
As part of the company's Comprehensive Efficiency Program handling the installation of energy efficient process chilling equipment, Unitil provided $85,000 in rebates toward an energy efficient 250 ton chiller and 2 closed circuit coolers. The new equipment replaced aging process cooling equipment that was inefficient and required high maintenance. The new closed circuit cooling towers allowed Dennison to use condenser water in their process, thus eliminating existing die heaters that re-heated previous chilled water.
Total Project Cost: $333,280
Total Incentives: $85,000
Participant Cost: $248,280
Estimated Annual Bill Savings: $100,000 or 1,000,838 kWh
Estimated Lifetime Bill Savings: $13,818,104

The second largest portion of funding ($33.1 million) was spent on Lost Opportunity/New Construction programs. These programs focus on encouraging investment in higher energy efficiency at the time of a naturally-occurring market event, such as construction of a new home or building, major expansion, renovation or remodeling, or replacement of failed equipment. These programs not only provide immediate and long-term savings to participants through rebates, but also target key market players (e.g., architects, designers, and builders) in order to change standard building practice and to upgrade building codes and standards, benefiting all customers over the long-term.

Cape Light Compact
Small Commercial & Industrial Program

Cape Cod & Islands Council, Inc., Yarmouth Port
Cape Light Compact and the Rotary Club combined to finance the replacement of inefficient lighting fixtures with newer energy-efficient models in the Council Service Center and at the Boy Scouts' Camp Greenough.
Total Project Cost: $7,434.50
Total Incentives: $5,947.60
Rotary Club Donation: $1,486.90
Estimated Annual Bill Savings: 10,275 kWh or $1,150
Estimated Lifetime Bill Savings: 112,820 kWh or $12,622

Over 10 percent of expenditures ($14.8 million) was spent on Regional Market Transformation programs. These programs are typically implemented on a joint basis by distribution company administrators in Massachusetts, coordinated by the Northeast Energy Efficiency Partnership. While these programs provide some immediate savings to participating customers, more importantly, they aim to change the production, purchasing, design, and stocking practices of manufacturers, builders, engineers, architects, and retailers over the long-term. By changing the market practices of these participants to promote purchases of higher energy-efficiency and product services, these programs improve long-term efficiency on a much larger scale than programs that focus on changing the behavior of end-use customers.

The remainder of year 2001 expenditures ($4.8 million) went largely to educational programs for residential customers with a minor portion to miscellaneous products and services across all sectors.

Program Cost-effectiveness Improved in 2001

According to the methodology for determining program cost-effectiveness [as approved by the Department of Telecommunications and Energy ("the Department")], 2001 ratepayer-funded programs were cost-effective with an overall benefit-cost ratio of over 2 to 1. This ratio measures the value of energy efficiency program savings compared to the associated program costs from a total resource perspective. Specifically, benefits are the value of wholesale electricity, and distribution and transmission costs *avoided* by distribution companies, as well as other resource and non-resource benefits due to program savings over the lifetime of year 2001 installations. Costs are those expended on program activities in year 2001, including participant costs.

NSTAR
Residential High Use Program

Michael Plone, Framingham
Mr. Michael Plone participated in NSTAR Electric's Residential High Use Program. The energy efficiency measures installed at his home included energy-efficient compact fluorescent bulbs, air sealing, attic insulation and replacement of the existing inefficient refrigerator with a new ENERGY STAR model. In addition to the installation of these measures, the program included diagnostic measurements for air leaks, heat pump efficiency, customer education, and a comprehensive health/safety test.
Total Project Cost: $3,706.78
Total Incentives: $2826.58
Participant Cost: $880.20
Estimated Annual Bill Savings: 7,438 kWh or $966
Estimated Lifetime Bill Savings: 114,369 kWh or $14,967

Program cost-effectiveness is measured according to guidelines of the Department. Beginning in 2000, the Department allowed a more comprehensive counting of benefits and costs, pursuant to its 98-100 Order. These additional benefits include increased worker productivity and property improvement for homeowners and businesses due to the installation of higher efficiency equipment. Energy efficiency investments also save distribution companies money by reducing such costs as bad debt expenditures and other costs that would be passed on to all customers. Further, customers accrue other resource savings such as reduced natural gas and water bills. For example, an energy efficient clothes washer will not only reduce electricity costs to wash the clothes, but will also reduce water use and if applicable, the gas used to heat the water.

The Department's 98-100 Order directed that, beginning in year 2000, the value of "post program effects/savings" be considered in cost-effectiveness analyses for market transformation programs (see "Program Activities Balance Short and Long-term Savings"). These savings are expected to accrue to customers over the long-term after these programs end (i.e., due to the programs transforming the market for particular technologies). Initial estimates of post program savings show substantial increases in program cost-effectiveness, resulting in an overall cost-benefit ratio of 1 to 2.5. The accuracy of these estimates is subject to further review by the Department.

Massachusetts Electric/National Grid
Small Commercial & Industrial Retrofit

Mor-wire & Cable, Lowell
In 2001, Mor-wire & Cable participated in Massachusetts Electric's Small Business Program. The company received incentives to install energy-efficient T-8 lighting fixtures.
Total Project Cost: $8,865
Total Incentives: $7,940
Participant Cost: $925
Estimated Annual Bill Savings: 24,494 kWh or $2,143
Estimated Lifetime Bill Savings: 168 MWh or $14,698

Conclusion

The Division concludes that 2001 energy efficiency program activities continued to effectively address the statewide energy efficiency goals. They provided substantial net economic benefit in terms of bill savings to participating customers, and system savings for all customers in the form of generation, transmission and distribution cost savings over the long-term. They also helped to reduce wholesale energy prices in the short-term, costs that would ultimately be paid for by customers. Moreover, they helped to create new jobs in the state both in the short term due to investments in energy efficiency industries, and in the long term through continued bill savings over the lifetime of these investments. Finally, they reduced harmful emissions from fossil-fueled power plants, thus helping to improve air quality. These direct and indirect impacts of the energy efficiency programs continue to benefit the Commonwealth's economy and its citizens. Currently, the energy efficiency programs are scheduled to continue through 2007.

For further information on 2001 energy efficiency activities, please refer to the full report that can be found at the Division's web site: http://www.mass.gov/doer.

Western Massachusetts Electric Company
Comprehensive New Construction Program
Medium/Large Commercial & Industrial New Construction

The Naismith Basketball Hall of Fame, Springfield
The new Hall of Fame Building is an interactive museum with adjoining retail and conference areas. Two premium efficiency centrifugal chillers of 350 tons were installed. Each was equipped with a variable frequency drive which reduces their Integrated Part Load Value (IPLV) to an incredibly low 0.361 kW/ton cooling. Variable frequency drives on air handler fans were also installed, in addition to variable frequency drives on the chilled water and hot water pumps that precisely match energy use to changes in load conditions. Also, a Static Pressure Reset on variable air volume fans that automatically adjusts the static pressure set point based on the minimum system air volume required was installed.
Total Cost of Project: $800,000 est.
Total Incentives: $164,000
Estimated Annual Bill Savings: 715,000 kWh or $64,350
Estimated Lifetime Bill Savings: 12,074,000 kWh or $1,086,660

Massachusetts Energy Efficiency Programs Win Top Honors Nationally

Electric utilities operating energy efficiency programs in Massachusetts were recently recognized for having 10 of the top 31 exemplary energy efficiency programs in the country. The American Council for an Energy Efficient Economy recognized Massachusetts Electric/National Grid with four exemplary program awards, and Western Massachusetts Electric/Northeast Utilities with two awards. In addition, sponsors of the Northeast Energy Efficiency Partnership, consisting of NSTAR, Massachusetts Electric/National Grid, Western Massachusetts Electric/Northeast Utilities, Fitchburg Gas & Electric/Unitil, Cape Light Compact and other regional utilities, were recognized with four exemplary program awards. The number of exemplary awards to companies operating energy efficiency programs in Massachusetts led the nation. California, with an energy efficiency budget several times greater than Massachusetts, was the next highest state with eight awards. Summaries of the recognized programs and a full description of the selection process can be found at: www.aceee.org

ACEEE Award Winning Massachusetts Programs

Massachusetts Electric/National Grid
Small Commercial Programs-Small Business Service Program
Commercial & Industrial New Construction Programs-Design 2000 Plus
Commercial & Industrial Custom and Comprehensive Programs-Energy Initiatives Custom Measures
School and Municipal Government Programs-Schools Initiative

Sponsors of the Northeast Energy-Efficiency Partnerships, Inc.
Home Energy Appliances Program-ENERGY STAR Appliances
Residential Lighting Program-ENERGY STAR Lighting
Commercial & Industrial HVAC-Cool Choice
Professional Education-Building Operator Certification & Flexible Technical Assistance

Western Massachusetts Electric Company/Northeast Utilities
Commercial & Industrial New Construction Programs-Energy Conscious Construction
Commercial & Industrial Custom and Comprehensive Programs-Customs Services

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